

Physics 106: Physics of Music

Professor: Lyle Hoffman

Spring 2017

Month	Date	Topic	Reading	Work Due
Jan.	23	Introduction and overview		<i>No lab</i>
	25	Motion and Dynamics	Ch. 1	
	27	Oscillations	Ch. 2	
	30	LAB 1: Simple and Coupled Oscillations		
Feb.	1	Waves	Ch. 3.1-6	
	3	Interference, etc.	Ch. 3.7-12	Homework 1
	3	<i>Orpheus Chamber Orchestra with Vadim Gluzman</i>		<i>Concert</i>
	6	LAB 2: Standing Waves on Strings		
	8	Resonance	Ch. 4.1-4	
	10	Standing Sound Waves	Ch. 4.5-11	Homework 2
	11	<i>Marianne Solivan & The Big Band</i>		<i>Concert</i>
	13	Lab 3: Resonances in Air Columns		
	15	Hearing	Ch. 5	
	17	Loudness	Ch. 6	Homework 3
	18	<i>Tanya Tagaq</i>		<i>Concert</i>
	20	LAB 4: Pitch and Loudness		
	22	Pitch	Ch. 7.1-8	

	24	Timbre	Ch. 7.9-14	Homework 4
	25	<i>David Holt</i>		<i>Concert</i>
	26	<i>Apollo's Fire</i>		<i>Concert</i>
	27	LAB 5: Fourier Synthesis		
Mar.	1	Combination Tones	Ch. 8.1-9	
	3	Harmony and Dissonance	Ch. 8.10-15	Homework 5
	6	Scales and Temperament	Ch. 9	<i>No lab</i>
	8	Review Chs. 1-9		
	10	MIDTERM EXAM		
	13-17	<i>Spring Break</i>		
	20	Plucked Strings	Ch. 10.9-16	
	22	Bowed Strings	Ch. 10.1-8	
	24	Brasses	Ch. 11	Homework 6
	27	LAB 6: Analysis of Live Sound		
	29	Woodwinds: Reeds	Ch. 12.1-9	
	30	<i>Quatuor Ebene</i>		<i>Concert</i>
	31	Woodwinds: Air Streams	Ch. 12.10-15	Homework 7
Apr.	3	LAB 7: Synthesis of Strings and Winds		
	5	Idiophones	Ch. 13.1-6	
	7	Membranophones	Ch. 13.7-19	Homework 8
	10	Harpsichord and Piano	Ch. 14.1-8	<i>No Lab Meet in Williams Center</i>
	12	Pipe Organ	Ch. 14.9-16	<i>Meet at Colton Chapel</i>
	12	<i>Stephane Wrembel & His Band</i>		<i>Concert</i>
	14	Speech	Ch. 15.1-4	Homework 9
	17	LAB 8: Synthesis of Kettledrum		

	19	Formants	Ch. 15.5-9	
	21	Singing	Ch. 17	Homework 10
	24	LAB 9: Synthesis of a Tone of Choice		
	26	Reverberation Time	Ch. 23.1-6	
	28	Auditorium Acoustics	Ch. 23.7-14	
	29	<i>Hasu Patel & Guests</i>		<i>Concert</i>
May	1	LAB 9: Continued		
	3	Review of Syntheses		
	5	Review for Final		Homework 11
		<i>Final Exam</i>		Scheduled by Registrar

Text:

- Rossing, Moore & Wheeler, *The Science of Sound*, 3rd Ed.
- Additional reading online and from *Scientific American*, in Skillman

Student Learning Outcomes: After completing this course, a student should be able

- to understand that the goal of physics is to comprehend phenomena in the physical world;
- to demonstrate the ability to formulate a testable hypothesis based upon acquired physical data;
- to collect and analyze experimental data relevant to testing a hypothesis;
- to evaluate whether the evidence supports, refutes, or leads to the revision of the hypothesis;
- to create, interpret, and critically evaluate graphs, tables and models of physical data;
- to understand scientific uncertainty and how it is reduced with additional data acquisition and hypothesis testing;
- to distinguish between scientifically testable ideas and opinion;
- to understand, identify, and apply the fundamental principles of physics to the production and perception of musical sound; and
- to engage in the process of doing physics, including such tasks as developing and testing models, interpreting experimental data, solving problems, and communicating results.

Requirements:

- Midterm exam, in class, consisting of quantitative and qualitative problems.
- Final exam, scheduled by the registrar, problems and essay questions.
- Early or makeup exams only for Dean's Excuses.
- Nine in-class laboratory exercises, 1:10-4 pm on Mondays as scheduled on the syllabus. Reports to be submitted at the end of the lab.
- Weekly homework consisting of problems based on readings from your text, occasional *Sci. Am.* articles and Web pages.
- Three concert reports, about 2 pages each, relating what you see and hear in the performance to the acoustics discussed in class.
- Full participation in class discussions.

Academic Honesty:

- *Discussion* of homework questions with your classmates is encouraged.
- *Copying* of another student's responses is of no use to anyone. Papers that appear to have been copied from one another will be considered to be instances of academic dishonesty and will be submitted to the Dean of the College for adjudication.
- Conspiring with another student to submit identical responses will be treated as copying.
- Please refer to the statement on "Principles of Intellectual Honesty" in the Student Handbook.

Registrar's Mandatory Privacy Statement:

- Moodle contains student information that is protected by the Family Educational Right to Privacy Act (FERPA). Disclosure to unauthorized parties violates federal privacy laws. Courses using Moodle will make student information visible to other students in this class. Please remember that this information is protected by these federal privacy laws and must not be shared with anyone outside the class. Questions can be referred to the Registrar's Office.

Federal Credit Hour Compliance Statement:

- The student work in this course is in full compliance with the federal definition of a four credit hour course.

Your grade will be based on:

- Lab reports: 20% total
- Homework: 20% total

- Three concert reports: 10% total
- Midterm and final exams: 25% each

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